

Neutrino masses from new Weinberg-like operators

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The unique dimension-5 effective operator, LLHH, known as the Weinberg operator, generates tiny Majorana masses for neutrinos after electroweak spontaneous symmetry breaking. If there are new scalar multiplets that take vacuum expectation values (VEVs), they should not be far from the electroweak scale. Consequently, they may generate new dimension-5 Weinberg-like operators which in turn also contribute to Majorana neutrino masses. In this study, we consider scenarios with one or two new scalars up to quintuplet SU(2) representations. We analyse the scalar potentials, studying whether the new VEVs can be induced and therefore are naturally suppressed, as well as the potential existence of pseudo-Nambu-Goldstone bosons. Additionally, we also obtain general limits on the new scalar multiplets from direct searches at colliders, loop corrections to electroweak precision tests and the W-boson mass.

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